

REMARKS

Entry of the foregoing and reconsideration of the subject application are respectfully requested in light of the amendments above and the comments which follow.

As correctly noted in the Office Action Summary, claims 4, 6 and 9-20 were pending. By the present response, claims 4 have been amended. Thus, upon entry of the present response, claims 4, 6 and 9-20 remain pending and await further consideration on the merits.

Support for the foregoing amendments can be found, for example, in at least the following locations in the original disclosure: the original claims and the specification, para [0008].

CLAIM OBJECTIONS

Claims 4 and 10 are objected to because of informalities. Claims 4 and 10 have been amended to address the objection raised in the Official Action. Reconsideration and withdrawal of the objection is respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. §112

Claims 4, 6 and 9-20 have been rejected under 35 U.S.C. § 112, first paragraph, on the grounds set forth in paragraph 4 of the Official Action. By the present response, Applicants have amended claim 4 consistent with the specification at paragraph [0008]. Withdrawal of the rejection is respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. §103

Claims 4, 9-13 and 15-20 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,507,551 to Howard et al. (hereafter "*Howard et al.*") in view of Applicant's Admitted Prior Art, U.S. Patent No. 5,369,511 to Amos (hereafter "*Amos*") and U.S. Patent Application Publication No. 2001/0029816 to Ben-Menachem et al. (hereafter "*Ben-Menachem et al.*") on the grounds set forth in paragraph 7 of the Official Action. For at least the reasons noted below, this rejection should be withdrawn.

In the Official Action, the Examiner alleges that the present claims are obvious over the combination of disclosures in *Howard et al.*, *Amos*, Admitted Prior Art and *Ben-Menachem et al.* when combined as proposed.

Howard et al. is relied upon for disclosing certain imaging apparatus housing elements and the inclusion of lenses. However, *Howard et al.* does not disclose that the first lens has a first aspheric profile on a first side and a second aspheric profile on a second side, the first side parallel to the second side and the second side facing the detector, wherein the second aspheric profile has a holographic optical element, and wherein the holographic optical element color corrects a first color band of infrared energy having wavelengths of 3 to 5 micrometer and coincidentally focuses at the common focal plane the first color band and a second color band of infrared energy having wavelengths of 8 to 12 micrometer as presently claimed.

Part of the combination making up the rejection relies upon the disclosure in *Amos*. Specifically, the Examiner points to the assertion of *Amos* that holographic optical elements (HOEs) are able to correct chromatic aberrations at all wavelengths. However, this disclosure in *Amos* has been misapplied and, when correctly

interpreted, it will be shown that the prior art of *Howard et al.* and *Ben-Menachem et al.* will not correctly image over multiple wavebands when combined with the teachings of *Amos*.

Amos describes the utility of a series of conical or pyramidal surfaces. One of the proposed methods of creating these cones and pyramids is with HOEs. In column 18, line 43 to column 19, line 9, *Amos* discusses the ability of HOEs in general. More specifically, HOEs are an implementation of *Amos's* canonical or pyramidal generators to correct chromatic aberrations. *Amos* states "However, binary optics techniques add a notched diffractive component to the refractive lens so that chromatic aberration is corrected." The "notched diffractive component" is the contribution of the standard HOE, which has a wavelength dependence and would require some additional method to correct all wavelengths of the electromagnetic spectrum. Thus, while *Amos* creates "a plethora of tiny staircase-type notches" (Column 19, lines 2-17), it is not a fundamental property of the HOE disclosed in *Amos* to correct all wavelengths of the electromagnetic spectrum.

To further illustrate the properties of HOEs, Applicants submit herewith portions of "Optical Design Fundamentals For Infrared Systems" by Max J. Riedl (SPIE Optical Engineering Press, 1995). The author discusses the properties of diffractive optics on pages 93-102 in the section titled "Diffractive (Binary) Optics." (The terms holographic, binary or diffractive are synonymous in optical surface design.)

Specifically referring to Figure 4.26, the use of diffractive surfaces to correct chromatic aberrations (as well as the combination of a HOE and a standard surface as mentioned by the Examiner) is shown. Note that, just like a standard optical

surface, a diffractive surface has a variation of focus position with wavelength, indicated by the short and long image positions in the diagram. These short and long image positions can be balanced with the short and long image positions of a standard refractive surface to make a chromatically corrected image.

However, there are limitations to the correction of an HOE. The limitations are put forward in section 4.5.2 Diffraction Efficiency and 4.5.5 "Useful" Spectral Bandwidth. The "useful" bandwidth mentioned here is less than that obtained from the claimed infrared imaging apparatus. The corrections of an HOE could more accurately be described as not increasing the bandwidth, but allowing for multiple bands.

Applying this understanding of the features and limitations of the HOE disclosed in *Amos*, it is respectfully asserted that the HOE of *Amos* cannot function to correct a first color band of infrared energy having wavelengths of 3 to 5 micrometer and coincidentally focus at a common focal plane the first color band and a second color band of infrared energy having wavelengths of 8 to 12 micrometer as presently claimed. Rather, at best *Amos*, corrects multiple bands of energy that are much closer in wavelength than that claimed.

Further, one of ordinary skill in the art reading the disclosures in the proposed combination would not be motivated to, nor would they understand how, to modify the features of the combined disclosures to arrive at an infrared imaging apparatus having the claimed combination and arrangement of features. For example, it has been noted above that the devices and methods of *Amos* require modification or additional method to correct all wavelengths of the electromagnetic spectrum. However, neither *Amos* nor the other references provide the missing teaching as to

how to modify *Amos* to arrive at the presently claimed infrared imaging system. In addition, none of the other presently cited references fill this deficiency.

Part of the Examiner proposed combination also relies upon the disclosure in *Ben-Menachem et al.* *Ben-Menachem et al.* discloses a lens element with two aspheric surfaces. However, the disclosed lens element does not teach or suggest the presently claimed imaging apparatus.

Further applying the above discussion on HOEs to the elements disclosed in *Ben-Menachem et al.*, it is respectfully asserted that the elements in *Ben-Menachem et al.* cannot corrects a first color band of infrared energy having wavelengths of 3 to 5 micrometer and coincidently focuses at the common focal plane the first color band and a second color band of infrared energy having wavelengths of 8 to 12 micrometer as presently claimed. Rather, the elements in *Ben-Menachem et al.* operate on only one of the two claimed wavelength ranges. This interpretation of *Ben-Menachem et al.* is supported by the disclosure in *Ben-Menachem et al.* itself. For example, *Ben-Menachem et al.* discloses at paragraph [0060], line 8, that when used in an IR thermal imaging system, the disclosed double aspheric lens operates in the 8-12 μm or the 3-5 μm wavelength range. In other words, the disclosure in *Ben-Menachem et al.* explicitly teaches that only one or the wavelength ranges manipulated by the presently claimed imaging apparatus is within the operating range of his apparatus. This is consistent with the above discussion of typical HOEs and the limitations to the correction of a typical HOE.

For at least the above reasons, the rejection should be withdrawn because the combined disclosures do not teach or suggest all of the features of the present claims.

Claims 6 and 14 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Howard et al.*, in view of Applicant's Admitted Prior Art, *Amos* and *Ben-Menachem et al.* as applied to claim 4 above, and further in view of U.S. Patent No. 6,034,407 to Tennant et al. (hereafter "*Tennant et al.*") on the grounds set forth in paragraph 8 of the Official Action. For at least the reasons noted below, this rejection should be withdrawn.

The disclosure in *Tennant et al.* does not contribute to overcoming the above-noted deficiencies in *Amos* with respect to the independent claim. Because claim 6 and claim 14 depend from the independent claim, they distinguish over the applied combination of references for at least the same reason as the independent claim. Withdrawal of the rejection is respectfully requested.

CONCLUSION

From the foregoing, further and favorable action in the form of a Notice of Allowance is earnestly solicited. Should the Examiner feel that any issues remain, it is requested that the undersigned be contacted so that any such issues may be adequately addressed and prosecution of the instant application expedited.

Respectfully submitted,

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